CLAIMS

I claim:

1. A thermionic cathode comprising

a crystalline emitter having a tip and a cone; and

a carbon coating applied to the outer surface of said cone.

2. A thermionic cathode as in claim 1, wherein said crystalline emitter is single crystal Lanthanum Hexaboride (LaB6).

3. A thermionic cathode as in claim 1, wherein said cone has a cone angle in the range of 20 to 60 degrees.

4. A thermionic cathode as in claim 1, wherein said carbon coating is selected from the group consisting of pyrolytic carbon and diamond-like carbon (DLC).

5. A thermionic cathode as in claim 1, wherein said cone has a surface micro-roughness and wherein said carbon coating has a thickness of a least twice said micro-roughness.

6. A thermionic cathode as in claim 5, wherein said thickness is from 8 to 10 μm.

7. An improvement in a thermionic cathode having a crystalline emitter with a tip and a cone, the improvement comprising:

a carbon coating applied to an outer surface of said cone.

8. The improvement of claim 7, wherein said crystalline emitter is single crystal Lanthanum Hexaboride (LaB6).

9. The improvement of claim 7, wherein said cone has a cone angle in the range of 20 to 60

degrees.

10. The improvement of claim 7, wherein said carbon coating is selected from the group consisting of pyrolytic carbon and diamond-like carbon (DLC).

11. The improvement of claim 7, wherein said cone has a surface micro-roughness and wherein said carbon coating has a thickness of at least twice said micro-roughness.

12. The improvement of claim 11, wherein said thickness is from 8 to 10 μm.

13. An electron emission apparatus, comprising

a thermionic cathode comprising

a crystalline emitter having a tip and a cone; and

a carbon coating applied to the outer surface of said cone;

an emitter heater; and

a support for said crystalline emitter.

14. An electron emission apparatus as in claim 13, wherein said crystalline emitter is single crystal Lanthanum Hexaboride (LaB6).

15. An electron emission apparatus as in claim 13, wherein said cone has a cone angle in the range of 20 to 60 degrees.

16. An electron emission apparatus as in claim 13, wherein said carbon coating is selected from the group consisting of pyrolytic carbon and diamond-like carbon (DLC).

17. An electron emission apparatus as in claim 13, wherein said cone has a surface micro-roughness and wherein said carbon coating has a thickness of at least twice said micro-

roughness.

18. An electron emission apparatus as in claim 17, wherein said thickness is from 8 to 10 μm.

19. A method of manufacturing a crystalline emitter for use in a thermionic cathode, comprising the step of

applying a carbon coating to an outer surface of a cone of said crystalline emitter.

20. The method of claim 19, wherein said carbon coating contains no pinholes.

21. The method of claim 19, wherein said crystalline emitter is single crystal Lanthanum Hexaboride (LaB6).

22. The method of claim 19, wherein said cone has a cone angle in the range of 20 to 60 degrees.

23. The method of claim 19, wherein said carbon coating is selected from the group consisting of pyrolytic carbon and diamond-like carbon (DLC).

24. The method of claim 19, wherein said cone has a surface micro-roughness and wherein said carbon coating has a thickness of at least twice said micro-roughness.

25. The method of claim 24, wherein said thickness is from 8 to 10 μm.